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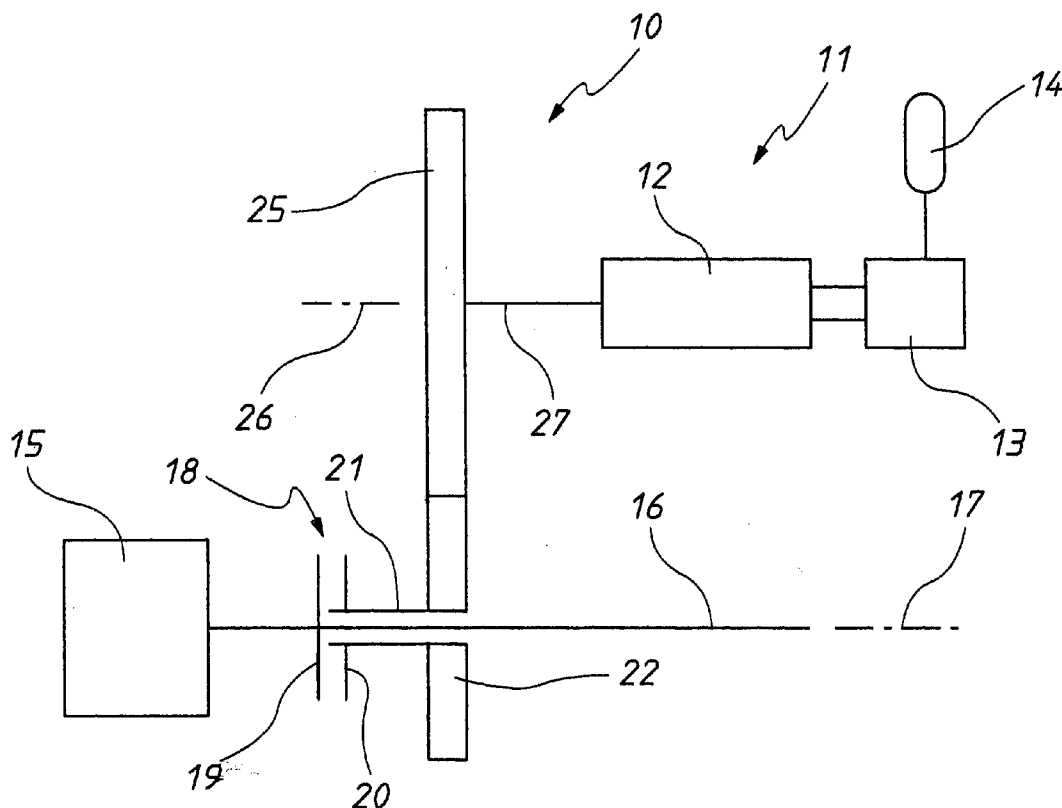
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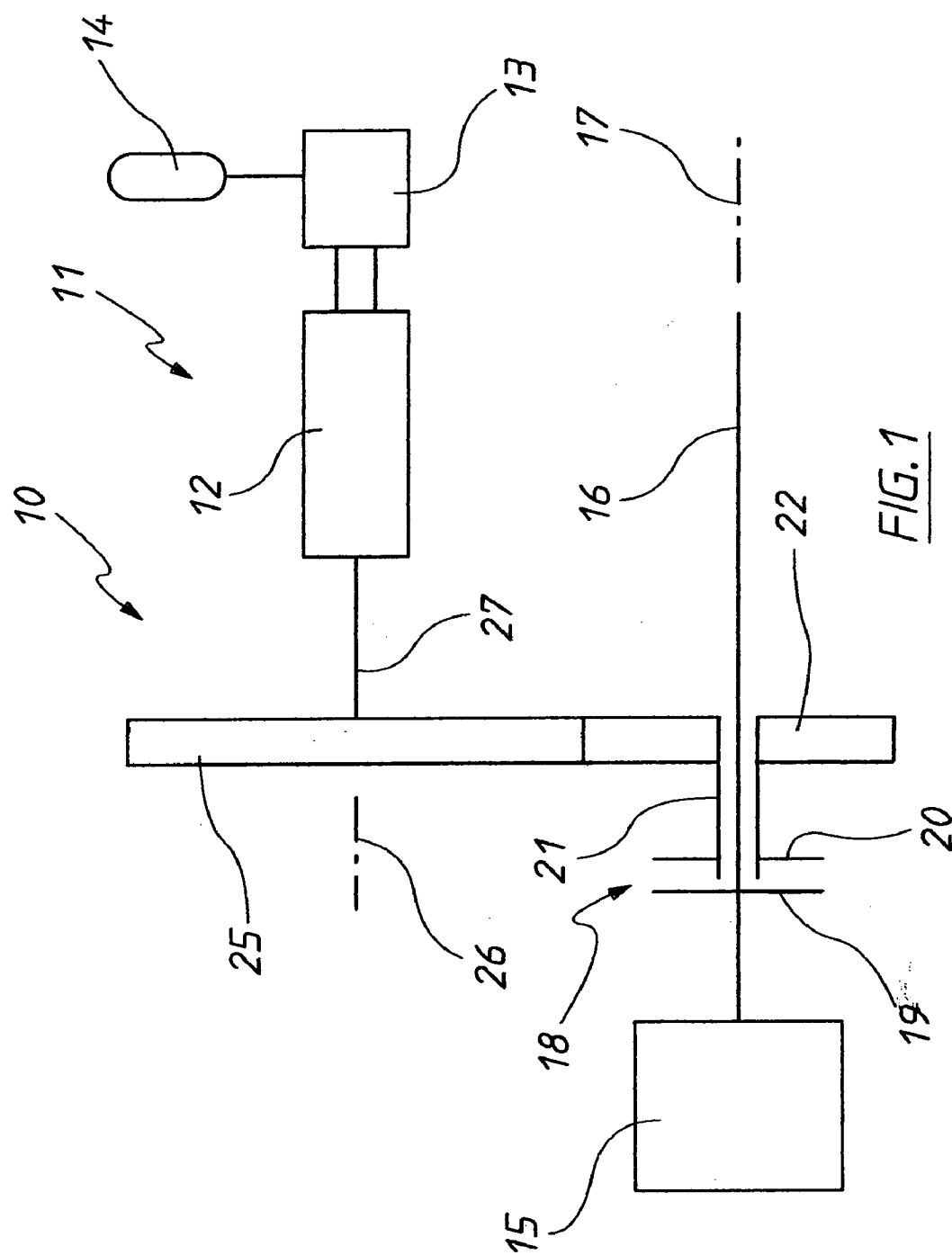
(57) **ABSTRACT**

A drive assembly (10) for a regenerative drive system (11) that incorporates a pump/motor (12) and an electronic and a hydraulic control system (13). When incorporated in a motor lorry, and the motor lorry is de-accelerating a second clutch part (20) of the assembly (10) is engaged with a first clutch part (19) to thereby drive the pump/motor (12). The pump/motor (12) is rendered inoperative by operation of a clutch (18).

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## DRIVE ASSEMBLY FOR A REGENERATIVE DRIVE SYSTEM

### TECHNICAL FIELD

**[0001]** The present invention relates to drive assemblies employing a clutch, and more particularly but not exclusively to drive assemblies for regenerative drive systems for motor vehicles such as motor lorries.

### BACKGROUND OF THE INVENTION

**[0002]** Described in International Patent Applications PCT/AU2005/001241, PCT/AU2006/001426, PCT/AU2003/001235, PCT/AU2003/001238, PCT/AU2003/001236, PCT/AU2003/001237, PCT/AU2003/000757, PCT/AU2003/001237, PCT/AU2003/00040, PCT/AU2003/00042 and PCT/AU2003/00041 are regenerative drive systems, including pumps/motors, electrical and hydraulic control systems, particularly adapted for motor lorries for the purposes of recovering energy that would be normally dissipated when a motor lorry is de-accelerating.

**[0003]** Regenerative drive systems typically are driven from a main drive shaft (such as a tail shaft) of the motor lorry. This includes the provision of a gear box that is displaced laterally relative to the drive shaft and which couples the drive shaft to the pump that is operated to charge a reservoir.

**[0004]** Although the object of these regenerative drive systems is to capture energy, they also lose energy due to the various gear mechanisms employed.

### OBJECT OF THE INVENTION

**[0005]** It is the object of the present invention to overcome or substantially ameliorate the above disadvantage.

### SUMMARY OF THE INVENTION

**[0006]** There is disclosed herein a drive assembly including:

**[0007]** a drive shaft having a longitudinal axis and that is rotatably driven about said axis;

**[0008]** a clutch surrounding the shaft and through which the clutch extends so as to provide a shaft portion beyond the clutch, the clutch having a first clutch part associated with the shaft so as to be rotated therewith, and a second clutch part selectively movable into engagement with the first clutch part so as to be drivingly associated therewith, and a drive member engaged with the second clutch part so as to be drivingly associated therewith so that the drive member and shaft portion can be simultaneously driven when the first and second clutch parts are engaged.

**[0009]** Preferably, said drive member is a first gear rotatable about said longitudinal axis, and said assembly includes a second gear meshingly engaged with the first gear and rotatable about a gear axis that is displaced laterally from said longitudinal axis.

**[0010]** There is further disclosed herein a regenerative drive system including the above drive assembly, and a pump connected to said second gear to be driven thereby and to drive said second gear.

**[0011]** Preferably, said gear axis is generally parallel but transversely spaced from said longitudinal axis.

### BRIEF DESCRIPTION OF THE DRAWING

**[0012]** A preferred form of the present invention will now be described by way of example with reference to the accom-

panying drawing that schematically depicts a drive assembly for a regenerative drive system.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

**[0013]** In the accompanying drawing there is schematically depicted a drive assembly **10** for a regenerative drive system **11** that incorporates a pump/motor **12** and an electronic and a hydraulic control system **13** that delivers hydraulic fluid under pressure to a reservoir **14**. When the pump/motor **12** is being driven the reservoir **14** is charged with hydraulic fluid under pressure. However, the pump/motor **12** can also be driven by delivering hydraulic fluid under pressure from the reservoir **14** to the pump/motor **12** so that the pump/motor **12** can drive the drive assembly **10**.

**[0014]** The drive assembly **10** is coupled to an engine, gear box and clutch assembly **15** of a motor lorry. Extending rearwardly from the assembly **15** is a drive shaft **16** that extends to a rear axle via which the motor lorry would be typically driven. The shaft **16** has a longitudinal axis **17**. Accordingly the shaft **16** extends through the assembly **15** so as to have a portion **29** beyond the assembly **15**.

**[0015]** Surrounding the shaft **16** is a clutch **18** having a first clutch part **19** fixed to or at least operatively associated with the shaft **16** so as to rotate therewith when the shaft **16** is driven about its longitudinal axis **17**. The clutch **18** includes a second clutch part **20** that is selectively movable into engagement with the first clutch part **19** so as to be drivingly connected thereto. When spaced from the first clutch part **19**, the clutch part **20** is relatively stationary.

**[0016]** Attached to or fixed to the second clutch part **20** is a sleeve **21** to which there is attached a first gear **22**. The first gear **22** has as its longitudinal rotational axis the axis **17** and is rotated thereabout in unison with the first clutch part **20**.

**[0017]** Meshingly engaged with the gear **22** is a second gear **25** having a rotational gear axis **26** that is generally parallel to but transversely spaced from the axis **17**.

**[0018]** The gear **25** is connected via a shaft **27** to the pump/motor **12** of the regenerative drive system **11**.

**[0019]** In operation of the above described drive assembly **10**, when the motor lorry is de-accelerating the second clutch part **20** is engaged with the first clutch part **19** so that the gear **22** is driven together with the gear **25** and the pump/motor **12**. The pump/motor **12** then charges the reservoir **14**. When energy from the reservoir **14** is to be employed, the clutch parts **19** and **20** are again engaged and hydraulic fluid under pressure delivered to the pump/motor **12** from the reservoir **14** so that the system **11** drives the shaft **16**.

**[0020]** When the pump/motor **12** is not in operation, the clutch **18** is disengaged, that is the clutch part **19** and **20** are spaced so that the clutch part **20** is generally stationary. Accordingly the gears **22** and **25** as well as the pump/motor **12** are essentially inoperative, thereby saving the loss of energy.

**[0021]** Preferably, the assembly **15** includes a clutch that is disengaged when the clutch **18** is engaged to driving the pump/motor **12**.

#### 1. A drive assembly including:

a drive shaft having a longitudinal axis and that is rotatably driven about said axis;

a clutch surrounding the shaft and through which the clutch extends so as to provide a shaft portion beyond the clutch, the clutch having a first clutch part associated with the shaft so as to be rotated therewith, and a second clutch part selectively movable into engagement with the first clutch part so as to be drivingly associated therewith, and a drive member engaged with the second

clutch part so as to be drivingly associated therewith so that the drive member and shaft portion can be simultaneously driven when the first and second clutch parts are engaged.

**2.** The drive assembly of claim **1**, wherein said drive member is a first gear rotatable about said longitudinal axis, and said assembly includes a second gear meshingly engaged with the first gear and rotatable about a gear axis that is displaced laterally from said longitudinal axis.

**3.** In combination a regenerative drive system including the above drive assembly of claim **1**, and a pump connected to said second gear to be driven thereby and to drive said second gear.

**4.** The drive assembly of claim **1**, wherein said gear axis is generally parallel but transversely spaced from said longitudinal axis.

**5.** (canceled)

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